Complete Summary

GUIDELINE TITLE

Prevention of medication errors in the pediatric inpatient setting.

BIBLIOGRAPHIC SOURCE(S)

Stucky ER. Prevention of medication errors in the pediatric inpatient setting. Pediatrics 2003 Aug;112(2):431-6. PubMed

COMPLETE SUMMARY CONTENT

SCOPE

DISEASE/CONDITION(S)

Injury, sickness and health related to medication errors

GUIDELINE CATEGORY

Prevention

CLINICAL SPECIALTY

Family Practice
Nursing
Pediatrics
Pharmacology

INTENDED USERS

Advanced Practice Nurses
Allied Health Personnel
Hospitals
Nurses
Pharmacists

Physician Assistants
Physicians

GUIDELINE OBJECTIVE(S)

To provide actions and/or guidelines for policy, education, and communication to assist in decreasing the rate of pediatric medication errors in the inpatient setting

TARGET POPULATION

Hospitalized infants and children

INTERVENTIONS AND PRACTICES CONSIDERED

Multidisciplinary programs to significantly decrease medication errors, including:

1. Standardized equipment, measurement systems, staff education and procedures
2. Clear, legible, unambiguous prescriptions and drug orders
3. Computer-assisted drug ordering and monitoring
4. Patient/family involvement/education
5. Institutional quality assurance and quality performance activities

MAJOR OUTCOMES CONSIDERED

- Number and severity of preventable adverse drug events
- Rate of medication errors
- Types of medication errors
- Effectiveness of interventions to decrease medication errors
- Morbidity and mortality related to medication errors
- Health care costs associated with medication errors

METHODOLOGY

METHODS USED TO COLLECT/SELECT EVIDENCE

Hand-searches of Published Literature (Primary Sources)
Hand-searches of Published Literature (Secondary Sources)
Searches of Electronic Databases

DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

The guideline developer conducted a comprehensive review of the data electronically, from 1966 through August 2001. Search Strategy was as follows: Database MEDLINE (1966 to August Week 3 2001) *Medication Errors/pc (Prevention & Control) (172) *Medication Errors/ (1969) medication errors.mp. (3568) *Medication Systems/(220) *Medication Systems, Hospital/ (1217) *drug therapy/(8431) *medical records/(9816) *Drug Evaluation/(1482) *Documentation/(2284) *Prescriptions,

drug/(5606)*Pharmaceutical Preparations/(15196) *Insurance, Liability/(2768) *Jurisprudence/(8013) *LIABILITY, LEGAL/(2188) *Pharmacy Service, Hospital/(5531) *Pharmaceutical Services/(1357) *CLINICAL PHARMACY INFORMATION SYSTEMS/ (278) *medical informatics/ or *medical informatics applications/ or *medical informatics computing/ or *computer systems/ or *computers/ or *computers, mainframe/ or *microcomputers/ or *minicomputers/ or *computing methodologies/ or *software/ (34947) *Patient Care/ (257) patient safety.mp. (943) exp *PEDIATRICS/ (13542) *Adverse Drug Reaction Reporting Systems/ (666) *Risk Management/ (2938) 2 or 3 (3568) 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 (111366) 24 and 25 (1194) 1or 26 (1269) limit 28 to (English language and yr=1966-2001) (418) from 29 keep 1-200 (200) keep 201-400 (200) keep 401-418 (18).

Excluded were documents with strictly adult data. Older source documents were eliminated if a more recent article demonstrated stronger strength of evidence. Publications of randomized controlled trials, guidelines, and appropriate observational studies were selected. A MEDLINE +Adw-1966 to August week 3 2001+AD4 search was performed as well. From August 2001 until submission for publication, PubMed search for "pediatrics" and "medication errors" revealed additional new articles which were incorporated as appropriate.

NUMBER OF SOURCE DOCUMENTS

426

METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Expert Consensus

RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

Not applicable

METHODS USED TO ANALYZE THE EVIDENCE

Systematic Review

DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

Review and inclusion of the data was based on applicability to the inpatient setting with specific attention to improving safety for the pediatric patient. By nature of the topic, prospective, nonrandomized observational studies were common, with fewer published prospective randomized controlled trials. Data was initially reviewed by the guideline developer; these data and the draft recommendations were then reviewed with members of the American Academy of Pediatrics (AAP) Committee on Hospital Care and the Committee on Drugs.

METHODS USED TO FORMULATE THE RECOMMENDATIONS

Expert Consensus

DESCRIPTION OF METHODS USED TO FORMULATE THE RECOMMENDATIONS

Background information was obtained from the literature of many well-established sources to define the scope of the problem and specify areas for guideline development. Recommendations were created by incorporating data from the literature review and expert consensus.

RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Not applicable

COST ANALYSIS

Drug errors associated with morbidity and mortality increase inpatient health care costs by an estimated $4700 per hospital admission, or approximately $2.8 million annually for a 700-bed teaching hospital. In addition, time spent by the health care team tracking errors, such as missed doses, can have an effect on time available for direct patient care. In a study of medical liability suits filed from January 1985 through December 2001, the Physician Insurers Association of America found medication error was the fifth most common misadventure for pediatricians. More than 30% of these cases resulted in a paid claim, with total indemnity at $14.7 million. The economic burden for all areas of health care from drug misadventures exceeds $100 billion annually in the United States alone.

METHOD OF GUIDELINE VALIDATION

External Peer Review
Peer Review

DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

The guideline was validated through review by the following AAP entities: Committee on Hospital Care, Committee on Drugs, Committee on Medical Liability, Section on Hospital Care, Section on Anesthesiology and Pain Medicine, Section on Clinical Pharmacology and Therapeutics, Section on Critical Care, Section on Emergency Medicine, Section on Epidemiology, Section on Hematology/Oncology, Steering Committee on Clinical Information Technology, Steering Committee on Quality Improvement and Management. Additional validation through review was provided by the American Academy of Family Physicians and the U.S. Pharmacopeia.

RECOMMENDATIONS

MAJOR RECOMMENDATIONS

Recommendations uniquely pertinent to children are noted with an asterisk (*), and more general recommendations are noted with a bullet (•).

Hospitalwide System Actions and Guidelines

* Provide an adequate number of nursing and pharmacy staff trained to prepare, dispense, and administer medications to children (Crowley, Williams & Cousins, 2001; Kaushal et al., 2001).

* Establish and maintain a functional pediatric formulary system with policies for drug evaluation, selection, and therapeutic use.

* Standardize equipment throughout the institution, such as infusion pumps and weight scales (US Department of Health and Human Services, 2002).

* Standardize measurement systems throughout the institution, using for example only kilograms for weight rather than pounds or kilograms in different areas within the institution (US Department of Health and Human Services, 2002).

* Standardize order sheets to include areas for patient weight, old and new allergies, prescriber name, signature, and contact number.

* Where reasonable, computerize systems to check dose and dosage schedules, drug interactions, allergies, and duplicated therapies (Crowley, Williams & Cousins, 2001; Kaushal et al., 2001; Bates et al., 2001; Farbstein & Clough, 2001). Embedded templates or clinical pathway order sets (American Hospital Association [AHA], American Society of Health-System Pharmacists [ASHP], 2001 Part 5) with alert systems are examples. However, pediatric-specific templates are not yet readily available, and costs of computer system enhancements may be considerable. Implementation should be considered when templates proven for the pediatric population are available (Raschke, Gollihare & Wunderlich, 1998; Grissinger, 2002).

* Develop prospective error tracking systems run on a consistent basis to target and monitor common pediatric errors. Dose range limits and sound-alike errors are examples (Farbstein & Clough, 2001; AHA-ASHP, 2001 Part 4). As part of this tracking system, encourage reporting of even minor errors whether or not they have been corrected or are of minimal clinical significance.

* Develop and maintain a process for informing families of errors. This is important to provide family-centered care and commitment to quality.

* Develop an educational program for all hospital and medical staff in calculating, prescribing, preparing, and administering medications for children (Marino et al., 2000; Crowley, Williams & Cousins, 2001; Goldspiel, DeChristoforo & Daniels, 2000; Zangwill, Bolinger & Kamei, 2000; Cohen et al., 1996).

* Eliminate barriers to reporting adverse medication events (Farbstein & Clough, 2001; Stump, 2000; Wakefield et al., 1999) and encourage a nonpunitive culture for reporting and review of adverse events (D'Antonio & Cohen, 1999; Farbstein & Clough, 2001; Stump, 2000; Wakefield et al., 1999). Ensure that all staff members understand the method for reporting and are knowledgeable in Joint Commission on Accreditation of Healthcare Organizations (JCAHO)-mandated reporting rules (JCAHO, 2002). Reporting systems should follow the guidelines outlined in the American Academy of Pediatrics (AAP) policy statement "Principles of Patient Safety in Pediatrics," (National Initiative for Children's Health Care Quality Advisory Committee, 2001) which focus on system error root cause analysis.

- Provide a suitable work environment for safe, effective drug preparation (Crowley, Williams & Cousins, 2001).
- Establish a clearly defined system for drug ordering, dispensing, and administering that includes review of the original drug order by appropriate pharmacy and nursing staff before dispensing and before administration (Crowley, Williams & Cousins, 2001). Computerized physician or prescriber order entry (CPOE), a computerized record for medication administration, and individual patient bar coding are examples (Grissinger, 2002; Wilson et al., 1997; Vecchione, 2002).
- Encourage a team environment for review of orders among nurses, pharmacists, nurse practitioners, physician assistants, and physicians.
- Provide ongoing formal quality improvement of the therapeutic use of medications, including a drug-use evaluation program.
- Maintain medication profiles for inpatients and ambulatory patients receiving care at the hospital, with updated allergy histories with each encounter. This profile may include current and past-year medications lists, adverse drug reactions history, pharmacokinetics, and allergies.
- Encourage use of methodology for error and prospective data analysis and tracking, such as plan-do-check-act/plan-do-study-act format and evidence-based medicine (Farbstein & Clough, 2001) review.
- Communicate plans and results from plan-do-check-act studies and the pharmacy and therapeutics committee quality improvement program in a consistent manner with information systems, the medical staff, and educational committees ("Effective executive leadership," 2000; Weingart, 2000).

Prescriber Actions and Guidelines

Physician prescriptions and drug orders are a means of communicating, so they must be legible, clear, and unambiguous. The following steps help ensure that medication orders communicate safely and effectively.

* Confirm that the patient's weight is correct for weight-based dosages. Ensure that weight-based dose does not exceed the recommended adult dose. Ensure that calculations are correct. Write weight on each order written.

* Include dose and volume when appropriate; specify exact dosage strength to be used.

* Write intravenous fluid orders clearly, ensuring that additives are quantified per liter and rates are noted per hour.

- Identify patient drug allergies and inquire about any changes at each encounter. Note any old and new allergies on orders.
- Write out all instructions rather than using abbreviations except for those approved by the institution.
- Avoid vague instructions (e.g., "take as directed"); make instructions specific (e.g., "take 1 tablet each morning").
- Avoid use of a terminal zero to the right of the decimal point (e.g., use 5 rather than 5.0) to minimize 10-fold dosing errors.
- Use a zero to the left of a dose less than 1 (e.g., use 0.1 rather than .1) to avoid 10-fold dosing errors.
- Avoid abbreviations of drug names (e.g., MS may mean morphine sulfate or magnesium sulfate).
- Use generic medication names rather than trade names.
- Spell out dosage units rather than using abbreviations (e.g., milligram or microgram rather than mg or Âµg; units rather than U).
- Ensure that prescriptions and signatures are legible, and include prescriber's name printed next to the signature, along with a contact number.
- Avoid use of verbal orders whenever possible. If verbal orders are to be used, spell out common error words (e.g., fifteen vs fifty).
- Utilize CPOE and standardized order sets when available (Crowley, Williams & Cousins, 2001; Grissinger, 2002; Cox, D'Amato & Tillotson, 2001; Offer, Wirtz & Farley, 1999).

Prescriber Education and Communication

* Stay current and knowledgeable concerning changes in medications and treatment of pediatric conditions.

* Utilize pharmacist consultation if available. An example is for adjustment of dose or dosing interval for neonates or for body surface area.

- Review the patient's existing drug therapy, including any over-the-counter medications or herbal or dietary supplements, and inquire about old and new allergies before prescribing medications.
- Remain familiar with individual hospital medication ordering systems.
- Ensure that drug orders are complete, clear, unambiguous, and legible. Discuss medication changes with nursing and other appropriate staff and families (Crowley, Williams & Cousins, 2001).
- When possible, speak with the patient or caregiver about the medication that is prescribed and any special precautions or observations that should be noted, such as allergic or hypersensitivity reactions. Encourage patients and families to ask questions about all medications ordered.
- Report errors and encourage blame-free error reporting. Ensure that all staff members understand the method of reporting and are knowledgeable about JCAHO reporting rules (JCAHO, 2002).
- Be aware of ongoing tracking systems and pharmacy programs and be actively involved in system development and review.

Pharmacy Actions and Guidelines

* Recheck calculations and ensure dose ordered falls within accepted pediatric weight-based dose ranges.

- Remain available to prescribers and nurses to participate in drug therapy development and monitoring.
- Reconfirm confusing medication orders.
- Recheck drug compatibility with existing medication list, and check for current allergy history.
- Review a copy of the original written medication order before dispensing a medication, except in emergency situations. Confirm patient identity, comparing order written to information available in the pharmacy system.
- Prepare drugs in a clean and orderly work area with minimal interruptions.
- Do not store look-alike or sound-alike medications adjacent to one another.
- Dispense medication in a timely fashion using a unit-dose, ready-to-administer form whenever possible.
- Where possible, use clinical pharmacologists to review procedures and orders (Kaushal et al., 2001; Leape, et al., 1999).

Pharmacy Education and Communication

* Develop institution-specific lists of pediatric drugs for drug-use evaluation and of high-risk drugs requiring cross-checks in concert with other hospital and medical staff.

- Provide education to patients or caregivers about their medications.
- Develop institution-specific satellite areas or personnel for consistency in handling and dispensing medications. Examples include total parenteral nutrition preparation sites, oncology satellite pharmacy, and anesthesia tray preparation and dispensing (Ringold, Santell & Schneider, 2000).
- Where available, integrate clinical pharmacists into patient care rounds (Leape, et al., 1999; Reilly, Wallace & Campbell, 2001; Hepler, 2001) with physicians and nurses, particularly in intensive care and oncology units.
- Develop and implement a prospective tracking system for errors and communicate consistently with information systems, the medical staff, and educational committees.
- Encourage blame-free error reporting. Ensure that all staff members understand the method of reporting and are knowledgeable about JCAHO reporting rules (JCAHO, 2002).

Nursing Actions and Guidelines

* Check medication calculations with another professional member of the health care team.

* Confirm patient identity before administration of each dose.

- Be familiar with medication ordering and dispensing systems.
- Verify drug orders before medication administration.
- Unusually large or small volumes or dosage units for a single patient dose should be verified.
- When a patient or parent or caregiver questions whether a drug should be administered, listen attentively, answer questions, and double-check the medication order.
- Remain familiar with the operation of medication administration devices and the potential for errors with such devices, particularly patient-controlled analgesia or infusion pumps.

Nursing Education and Communication

* Develop and maintain continuous education programs for nursing competencies in devices used for pediatric medication administration, particularly patient-controlled analgesia and infusion pumps.

* Develop and maintain pediatric medications knowledge base.

- Discuss medication orders with prescriber whenever possible.
- Integrate and provide education for patient and caregiver regarding the medication regimen.
- Record and verify patient identity, weight, allergies, and previous medication use.
- Be aware of and involved in ongoing error-tracking systems and pharmacy programs. Encourage blame-free error reporting. Ensure that all staff members understand the method of reporting and are knowledgeable about JCAHO reporting rules (JCAHO, 2002).

Patients and Families

* Communicate concerns and questions related to past or present medication administration to providers, including any developmental or behavioral barriers to successful medication administration.

- Inform physicians and hospital staff of any old and new allergies.
- Inform physicians and hospital staff about prescribed or over-the-counter medications the child is taking.
- Inform physicians and hospital staff about a child's use of complementary or alternative methods of health maintenance or therapeutic treatments, including herbal or dietary supplements.
- Be responsible for knowing medication names, strengths, and dosing. Ensure that dosing intervals are followed as prescribed. Ask questions to ensure understanding of medication administration. When possible, bring all current medications to the hospital for confirmation and review.
- Ensure that patient identity has been checked before medication administration.
- Ask questions about the purpose of each medication to be used.

CLINICAL ALGORITHM(S)

None provided

EVIDENCE SUPPORTING THE RECOMMENDATIONS

REFERENCES SUPPORTING THE RECOMMENDATIONS

References open in a new window

TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

The American Academy of Pediatrics has recognized and supported extensive studies and policies developed over the past decade by other organizations, such as the American Society of Health-Systems Pharmacists and the US Department of Health and Human Services. The recommendations in this guideline were based on a comprehensive review of published reports, best practices, and expert external reviewer expertise. Where data was not conclusive, recommendations were based on the consensus opinion of the group.

BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

POTENTIAL BENEFITS

- Decreased medication errors in the treatment of children
- Development of systems designed to identify and learn from errors
- Multi-disciplinary approach toward actions, guidelines, education, and communication including patients and families

POTENTIAL HARMS

Not stated

IMPLEMENTATION OF THE GUIDELINE

DESCRIPTION OF IMPLEMENTATION STRATEGY

An implementation strategy was not provided.

INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

IOM CARE NEED

Staying Healthy

IOM DOMAIN

Effectiveness
Patient-centeredness
Safety

IDENTIFYING INFORMATION AND AVAILABILITY

BIBLIOGRAPHIC SOURCE(S)

Stucky ER. Prevention of medication errors in the pediatric inpatient setting. Pediatrics 2003 Aug;112(2):431-6. PubMed

ADAPTATION

Not applicable: The guideline was not adapted from another source.

DATE RELEASED

2003 Aug

GUIDELINE DEVELOPER(S)

American Academy of Pediatrics - Medical Specialty Society

SOURCE(S) OF FUNDING

American Academy of Pediatrics

GUIDELINE COMMITTEE

Committee on Hospital Care and Committee on Drugs

COMPOSITION OF GROUP THAT AUTHORED THE GUIDELINE

Committee on Hospital Care, 2002-2003: John M. Neff, MD (Chairperson); Jerrold M. Eichner, MD; David R. Hardy, MD; Jack Percelay, MD, MPH; Ted Sigrest, MD; Erin R. Stucky, MD (Lead Author)

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FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

No known conflict of interest

GUIDELINE STATUS

This is the current release of the guideline.

American Academy of Pediatrics (AAP) Policies are reviewed every 3 years by the authoring body, at which time a recommendation is made that the policy be retired, revised, or reaffirmed without change. Until the Board of Directors approves a revision or reaffirmation, or retires a statement, the current policy remains in effect.

GUIDELINE AVAILABILITY

Electronic copies: Available from the American Academy of Pediatrics (AAP) Policy Web site.

Print copies: Available from American Academy of Pediatrics, 141 Northwest Point Blvd., P.O. Box 927, Elk Grove Village, IL 60009-0927.

AVAILABILITY OF COMPANION DOCUMENTS

None available

PATIENT RESOURCES

None available

NGC STATUS

This NGC summary was completed by ECRI on November 10, 2003. The information was verified by the guideline developer on November 24, 2003.

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